NTSB National Transportation Safety Board

Office of Railroad, Pipeline & Hazardous Materials Investigations

Mechanical

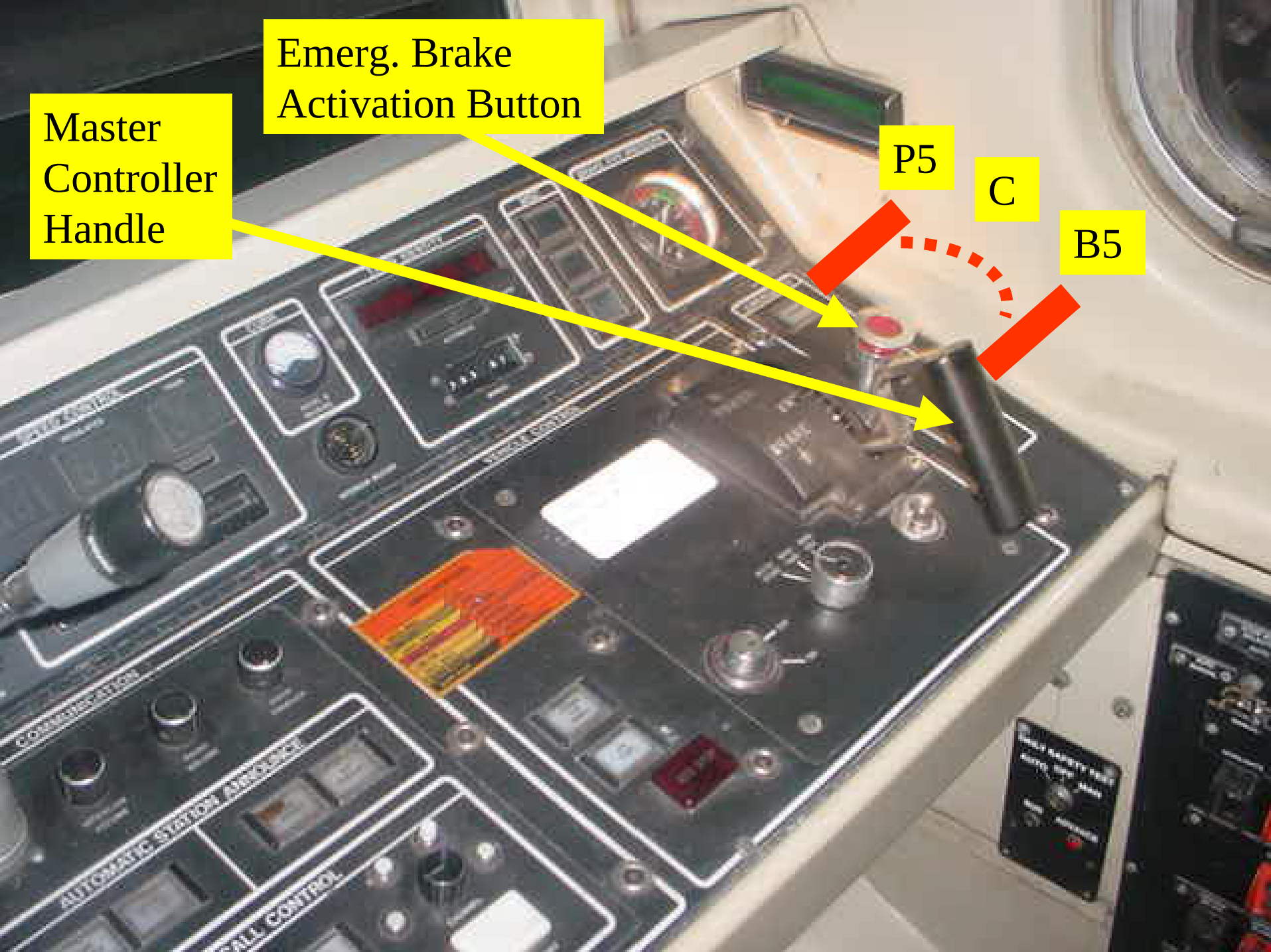
Rollback Protection

Rollback Protection

Automatic Train Control

- Automatic Train Supervision
- Automatic Train Protection
- Automatic Train Operation
  - Rollback Protection

Manual Mode Operation


Emerg. Brake
Activation Button
Master
Controller
Handle
P5
C
B5

Rollback Protection

Engineered Safety Redundancy

- For all equipped cars in automatic and/or manual mode.
- Activation brings a train rolling backwards to a stop.
- To ensure safety and control of train movement.

Rollback Protection

Initial Confusion – WMATA reported…

- All cars equipped with a rollback subsystem when in automatic operation (but not in manual).
- Rollback protection on some cars when operated in manual mode (but not all).
- Information varied during on-scene investigation regarding which cars were equipped with rollback (in manual or automatic).

Prompted an urgent recommendation.

Rollback Protection

Operator Information/Training

- No information provided to operators regarding how railcars are equipped.

- WMATA relies on
  - Daily experience in manual mode over time.
  - Exposure to the entire range of operating conditions to improve operator skills.

WMATA Postaccident Actions

November 7, 2004, WMATA issued a memorandum to all Train Operators and Supervisors:

- Advising them there was no rollback protection in manual mode on the 1000-series cars.
- To be aware of operating conditions related to grade that would affect train handling.

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WMATA Postaccident Actions

November 9, 2004, WMATA issued a supplemental memorandum to further remind operators and supervisors:

- No rollback protection in Manual mode on the 1000-series.
- "However, in Manual, your brake systems…are available and are to be used in accordance with operating conditions and consistent with your training…" and the provisions of the operating rules.

Urgent Recommendation R-04-9

To WMATA:

Immediately revise the directions to train operators contained in your memorandums of November 7 and 9, 2004, to include specific written instructions for identifying and responding to an emergency rollback situation, and provide training to operators on the procedures to follow if such a rollback event occurs. (Urgent).

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Response to Urgent Recommendation

November 23 and 24th WMATA Issued Bulletins to Train Operators stating:

1st - In manual mode, a rollback is to be stopped by application of the train brakes.

2nd - Should a rollback of greater than 5 seconds occur, apply maximum service brake in B-4 position.

3rd - Should the train not stop within another 4 seconds apply the emergency brakes.

Lastly, notify the Operations Control Center.

Safety Board's Reply to WMATA

- Asked WMATA to include a discussion of speed in its written instructions for identifying and responding to a rollback situation.

- Asked that these instructions be incorporated in WMATA's Initial Train Operator's Course and in its operator recertification training procedures

- Classified Urgent Recommendation R-04-09 "Open—Acceptable Response" on May 31, 2005.

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Response to Urgent Recommendation

WMATA's February 16, 2006, response to R-04-9:

- Disagree with the Safety Board's position.
- When to stop rollback is better based on time rather than speed.
- Belief that time-based criterion was best:
  - because it is simple and easily explained to, and understood by, the Train Operators.

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Investigative Findings

- Train Operators generally stop a rollback by first moving the master controller to a low power setting (P-1 or P-2), then adding more power as the situation warrants.

- Safety Board simulation testing showed that without rollback protection, after train speed exceeded 2 mph then even full power (P-5) would not slow or stop the train.

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Recommendation on Rollback Protection

- Without the rollback protection feature, the train's speed determines whether a power application can arrest the rollback or whether brakes must be applied to stop the train.

- WMATA does not include any discussion of rollback speed in the written instructions or training it provides to its train operators.

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